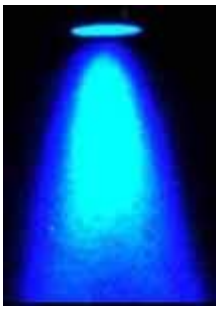
Soft-Start Polymerization Technique Revisited: Some Clinical Evidence (6/08)

Chan DCN, Browning WD, Frazier KB, Brackett MG. Clinical evaluation of the soft-start (pulse-delay) polymerization technique in class I and II composite restorations. Oper Dent 2008;33:265–271.

This clinical study evaluated two visible light polymerization modes on the parameters of marginal quality and post-operative sensitivity in posterior Class 2 and 1 resin restorations. The stated hypothesis was that delaying the resin gel point using a soft start photocuring technique would improve restoration marginal seal and lessen post-operative sensitivity. This double blind, randomized clinical trial restored 50 posterior Class 2 or complex Class 1 resin restorations in 20 patients. Three calibrated investigators used the same dental adhesive and restorative resin using an incremental restoration technique. The two polymerization techniques consisted of the following methods:

Soft Start (Quartz-Halogen Curing Unit)	Control (Plasma-arc Curing Unit)
1. Incremental dentin resin photocured 600 mW/cm^2 20 seconds; 2. Enamel resin photocured 200 mW/cm^2 for 3 seconds; 3. Wait 3 minutes; 4. Additional photocuring 200 mW/cm^2 for 3 seconds; 5. Wait an additional 5 minutes; 6. Final 600 mW/cm^2 photocuring for 20 seconds from multiple angles.	1. All photocuring at 2000 mW/cm^2 for 10 seconds

Restorations were finished and polished and were evaluated at two weeks, three months, one year, and at two years. Results found that there was no difference in sensitivity to a standardized cold stimulus or disparity in marginal integrity at any time period between the two curing methods ($p > 0.05$). The authors concluded that **within the limitations of this study, Class I and II restorations placed with a soft start photopolymerization technique did not demonstrate significant changes in post-op sensitivity or decreased signs of marginal stress.**



DECS Comment: Polymerization shrinkage inherent to dental resins during the curing process has been investigated widely in the scientific dental literature. The forces generated during this shrinkage has been theorized to stress the adhesive bond to tooth structure and has been attributed to the restoration marginal seal breakdown that is responsible for microleakage, restoration marginal staining, and the development of secondary caries. To compensate for the shrinkage force, many different photocuring regimens have been suggested over the years to include the soft-start mode, which has been suggested in different laboratory studies to reduce both microleakage and stresses imparted to tooth structure. This study reported the difference in marginal integrity and post operative sensitivity with posterior Class 2 and 1 posterior resins using a photocuring technique that has been suggested by laboratory studies to lessen polymerization stresses. It is noteworthy in this study that the controls were resins photocured using a plasma-arc curing light, as the plasma-arc technique has been suggested as generating greater polymerization stresses than any other technique. Accordingly, this control group curing method should have served to enhance any differences investigated during this study. However, this report identified no difference between the two photocuring techniques over a two-year period. The data from this and two other shorter clinical studies seems to suggest that the soft-start technique may not substantiate the extra time involved. It would be beneficial to continue this study and report statistically valid data for increased observation times.

References

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- Oberlander H, Fiedl KH, Schmalz G, Hiller KA, Kopp A. Clinical performance of polyacid-modified resin restorations using “softstart-polymerization”. Clin Oral Invest 1999;3:55–61.
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